Ascent: Flyweight In Situ Visualization and Analysis for HPC Simulations

CAES 2020 Computing, Data & Visualization Tutorial
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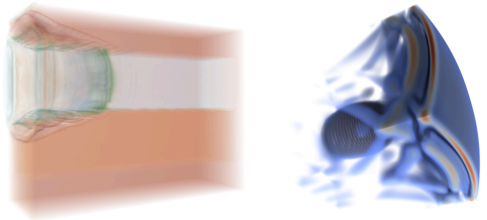
Ascent is an easy to use flyweight in situ visualization and analysis library for HPC simulations

- **Easy to use in-memory visualization and analysis**
  - Use cases: ***Making Pictures, Transforming Data,*** and ***Capturing Data***
  - Young effort, yet already supports most common visualization operations
  - Provides a simple infrastructure to integrate custom analysis
  - Provides C++, C, Python, and Fortran APIs
- **Uses a flyweight design targeted at next-generation HPC platforms**
  - Efficient distributed-memory (MPI) and many-core (CUDA or OpenMP) execution
    - Demonstrated scaling: In situ filtering and ray tracing across ***16,384 GPUs*** on LLNL's Sierra Cluster
  - Has lower memory requirements than current tools
  - Requires less dependencies than current tools (ex: no OpenGL)
    - Builds with Spack https://spack.io/

Ascent



Visualizations created using Ascent

python™ HDF

CINEMA

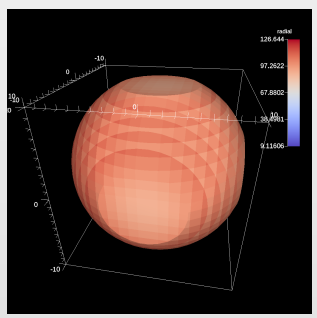
Extracts supported by Ascent

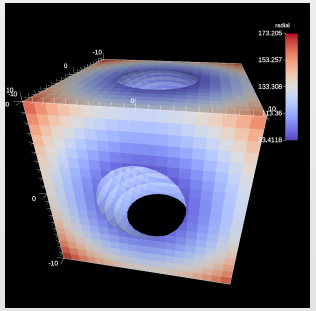
http://ascent-dav.org

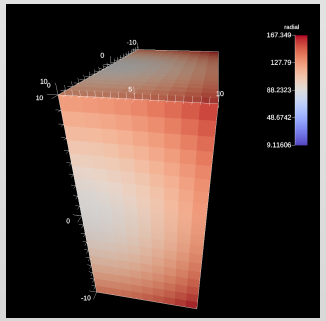
https://github.com/Alpine-DAV/ascent

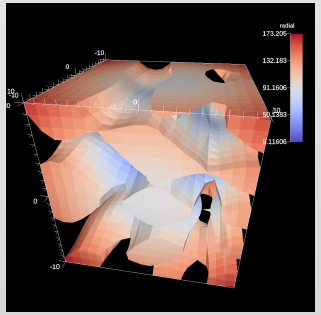
Website and GitHub Repo

Ascent is ready for common visualization use cases

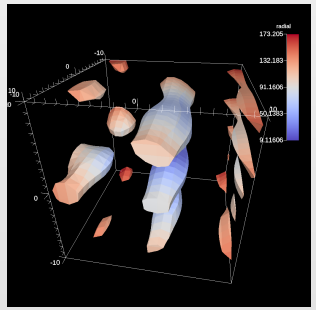




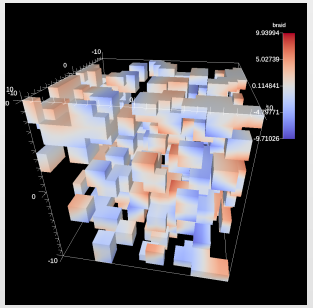




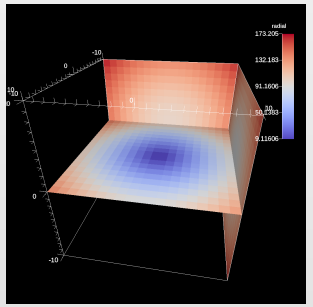
Clips



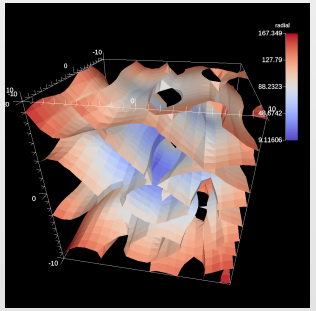
Iso-Volume



Threshold

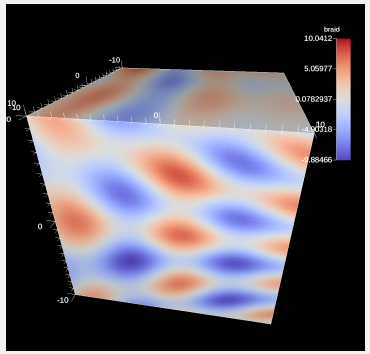


Slice

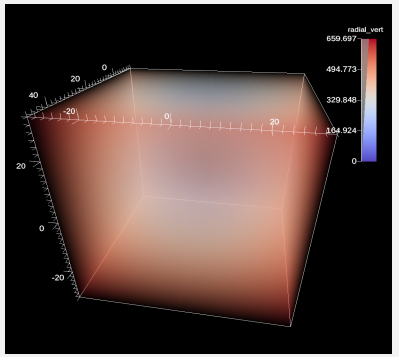


Contour

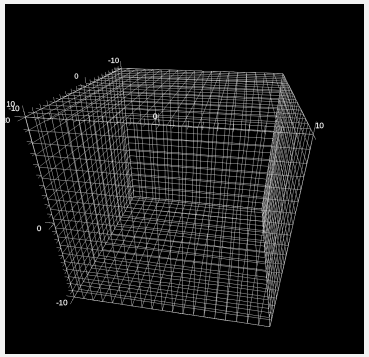
Rendering



Pseudocolor

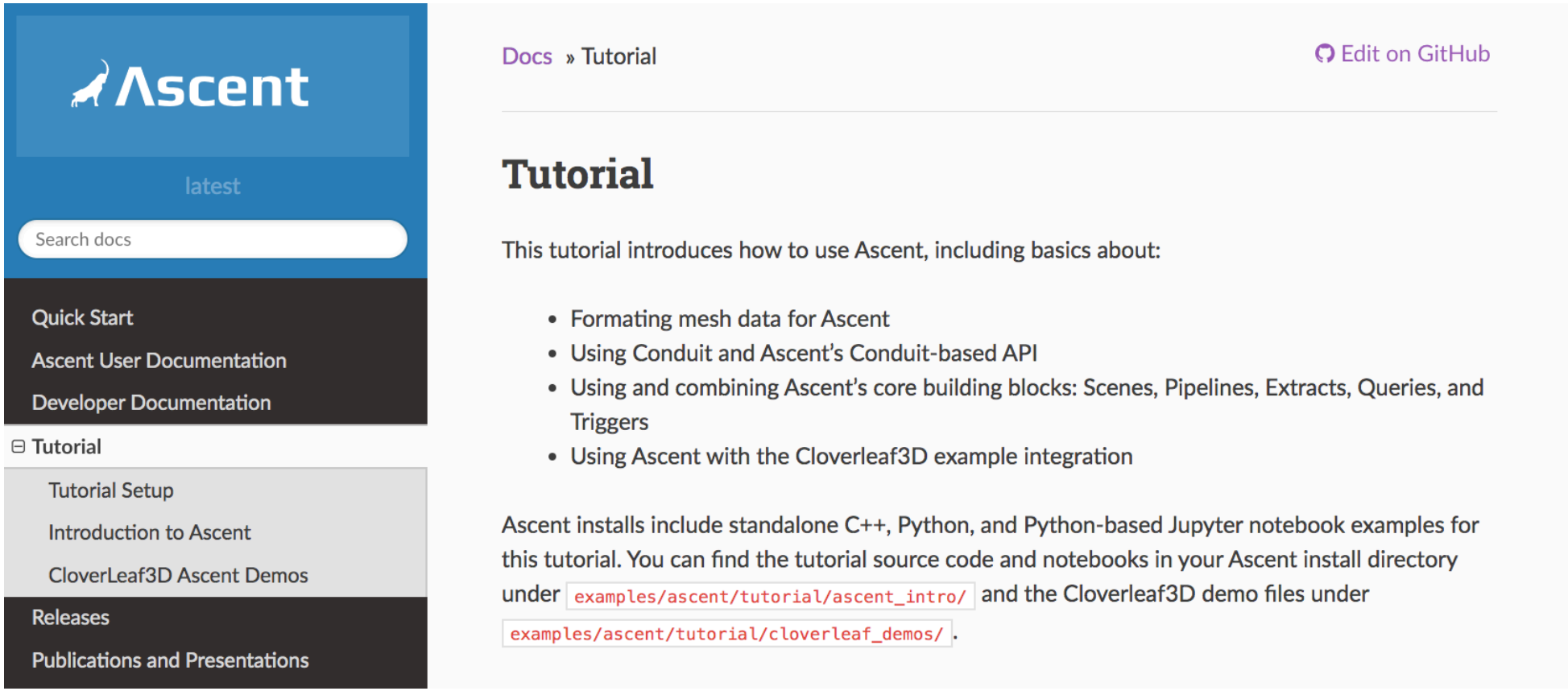


Volume



Mesh

Ascent tutorial examples are outlined in our documentation and included ready to run in Ascent installs



http://ascent-dav.org

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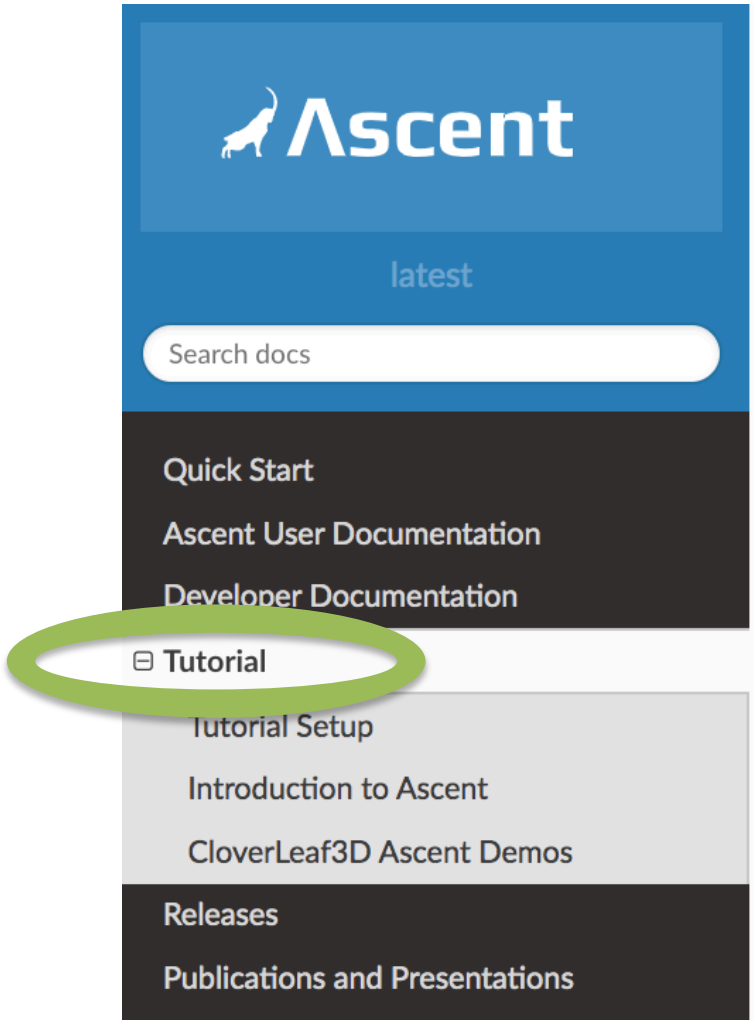
- http://ascent-dav.org
- Click on “Tutorial”



Ascent's interface provides five composable building blocks

Scenes
(Render Pictures)

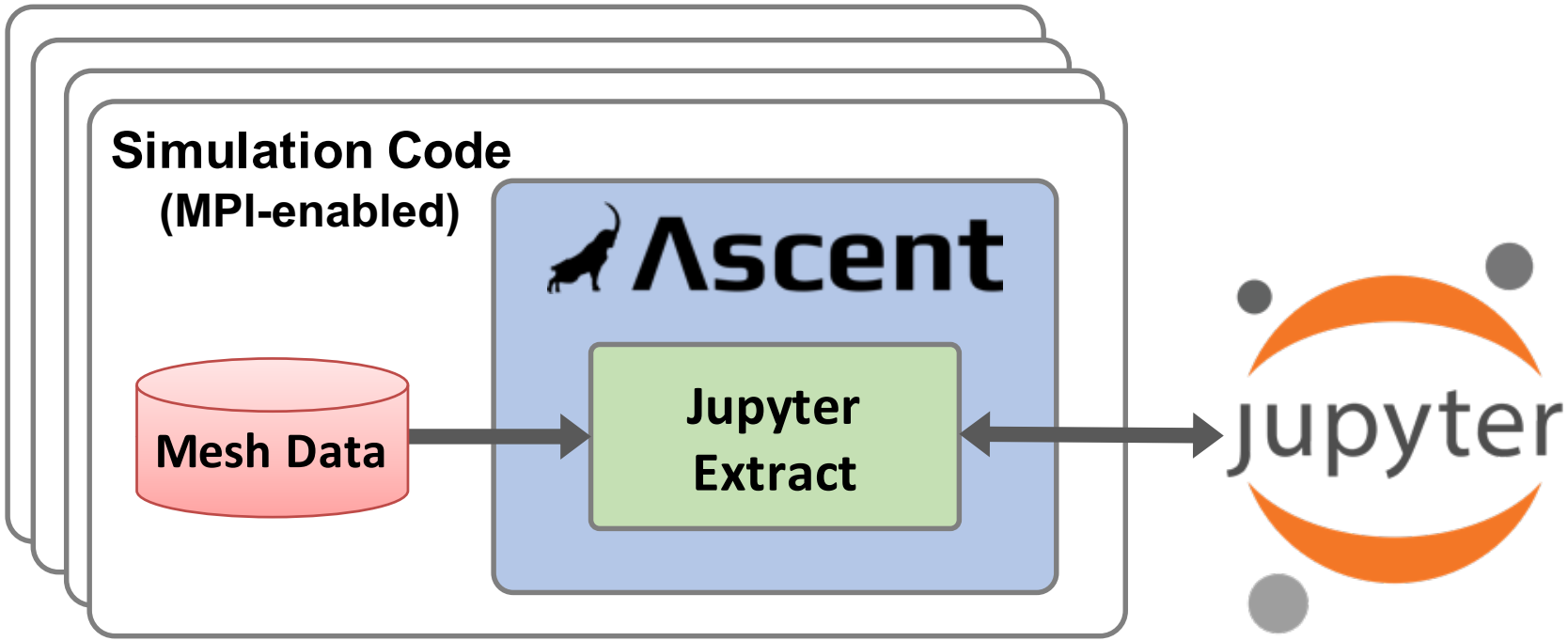
Pipelines
(Transform Data)

Extracts
(Capture Data)

Queries
(Ask Questions)

Triggers
(Adapt Actions)

Ascent's Jupyter Extract provides a path to connect your simulation to a Jupyter Notebook



With the *Jupyter Extract*, users of any simulation code with Ascent integrated can run Jupyter Notebooks and use Python to interact with in-memory data

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